

REMARKS

By way of this amendment and reply to the Office Action mailed April 28, 2003, claim 5 has been amended, and new claims 17-20 have been added. Claims 1 and 3-20 are presently pending for further consideration on the merits. It is noted that claims 6-15 are withdrawn from consideration as being drawn to non-elected species. ✓

This amendment adds and amends claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claims remain under examination in the application, are presented, with an appropriate defined status identifier.

In the Office Action, claim 5 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, due to the allegation in the Office Action that "w" and "p" are not defined in that claim. By way of this amendment and reply, claim 5 has been amended to overcome this rejection. Support for the amendments to claim 5 may be found in Figure 10 of the drawings.

In the Office Action, claims 1, 3-5 and 16 were rejected under 35 U.S.C. § 102(a) as anticipated by, or in the alternative under 35 U.S.C. § 103(a) as obvious over, U.S. patent No. 5,696,750 to Katayama; claims 1, 3-5 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,777,803 to Ju et al. and the acknowledged prior art in view of U.S. Patent No. 5,543,228 to Taniguchi et al.; and claim 16 was rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 9-245356 and JP 10-269588. These rejections are traversed with respect to the presently pending claims, for at least the reasons given below.

Rejections of Claims 1, 3-5 and 16 over Katayama under 35 U.S.C. 102(a) or 103(a):

Katayama discloses the use of a 3-beam method (Fig. 17) and the use of a push-pull method (Figs. 21 and 25) in connection with a method of detecting a tracking error signal. However, Katayama fails to disclose an embodiment using both the phase difference method and the push-pull method, as recited in ✓

the presently pending claims. Therefore, claims 1, 3-5 and 16 are patentable over the teachings of Katayama.

Furthermore, the hologram optical element described in Katayama is intended to use one of the 0th order light beam and the ± 1 st order diffraction light beams. As illustrated in Figs. 6A and 6B, the sectional shape is step-like. However, the respective stages are equal in width. The various examples of diffraction efficiency are described in conjunction with the use of the 0th order light beam (column 7, line 6), the use of the -1st order diffraction light beam (column 7, line 16), the use of the +1st order diffraction light beam (column 8, line 56), and the use of the 0th order light beam (column 8, line 63). According to these examples, when the 0th order light beam is used, the diffraction efficiency of the ± 1 st order diffraction light beams is equal to zero or extremely low so that the ± 1 st order diffraction light beams can not be used. In case where one of the ± 1 st order diffraction light beam is used, the diffraction efficiency of the other light beam is equal to zero or extremely low so that the other light beam can not be used. Furthermore, an unnecessary 0th order light beam is produced to decrease the efficiency of the diffraction light beam which is selectively used. ✓

By way of the optical system according to the present invention, it is possible to design the diffraction efficiencies of the +1st order diffraction light beam and the -1st order diffraction light beam so that the former is higher than the latter and that both of the light beams can be used. Furthermore, an unnecessary 0th order light beam is not produced. The above-mentioned design can be realized by a structure in which the widths of the adjacent stages in the hologram optical element are different from each other. Katayama does not disclose or suggest such structure of the present invention and the remarkable effect obtained by such a structure. Therefore, this invention is not anticipated or obvious from a combination of Katayama and the acknowledged prior art. ✓

Rejections of Claims 1, 3-5 and 16 over Ju in combination with Taniguchi, and the acknowledged prior art under 35 U.S.C. 103(a):

Figures 1, 3 and 10 of Ju do not teach or suggest a method of detecting a tracking error signal. Therefore, Ju has no particular relevance to an optical head apparatus (or method) using both the phase difference method and the push-pull method as recited in the presently pending claims.

Next, in the hologram optical element described in Ju, the sectional shape is step-like, as illustrated in Fig. 2C. However, all of the stages are equal in width in Ju's structure. In this event, it is impossible to realize the design such that both of the ± 1 st order diffraction light beams can be used without causing an unnecessary 0th order light beam, as discussed in (2). In Taniguchi, column 3, line 14 and thereafter, optimization of the diffraction efficiency of the hologram optical element is described. However, this description is directed to the hologram optical element in which the sectional shape is rectangular and the ± 1 st order diffraction light beams are equal in diffraction efficiency to each other.

By contrast, in the hologram optical element according to the present invention, it is possible to design the diffraction efficiencies of the +1st order diffraction light beam and the -1st order diffraction light beam so that the former is higher than the latter and that both of the light beams can be used. Furthermore, an unnecessary 0th order light beam is not produced. The above-mentioned design can be realized by a structure in which the sectional shape of the hologram optical element is step-like and the widths of the adjacent stages are different from each other. However, neither Ju nor Taniguchi nor the acknowledged prior art suggests or describes such structure of the present invention and the remarkable effect obtained by such a structure. Therefore, the presently pending claims are patentable over the combination of Ju, Taniguchi, and the acknowledged prior art.

Rejection of Claim 16 over JP 9-245356 and JP 10-269588 under 35**U.S.C. 102(a/b):**

JP 9-245356 discloses an optical head apparatus for detecting a focus error signal, a tracking error signal by the phase difference method and the push-pull method, and a data signal. However, the optical head apparatus of JP 9-245356 has a structure in which the data signal is detected by a total sum of reflected light beams reflected by the optical recording medium and received by the optical detector.

Similarly, JP 10-269588 discloses an optical head apparatus for detecting a focus error signal, a tracking error signal by the phase difference method and the push-pull method, and a data signal by wavefront-dividing the reflected light from the optical recording medium into a plurality of regions to be guided to the optical detector. However, in case of the wavefront division, the data signal must be detected from the total sum of the plurality of regions. Therefore, the optical head apparatus of JP 10-269588 must have a structure in which the data signal is detected from the total sum of the light beams received by the optical detector.

On the other hand, the present invention as recited in claim 16 is directed to a method in which the reflected light from the optical recording medium is amplitude-divided into the first group of light beams and the second group of light beams (i.e., the light is not divided into a plurality of regions but the entire region is divided into a plurality of light beams at a particular ratio) to be detected by the optical detector and the data signal is detected not from the total sum of the light beams received by the optical detector but from the first group of light beams alone. In case of the amplitude division, not the wavefront division, the data signal can be detected not from the total sum of a plurality of light but from one of the groups of light beams. Therefore the present invention recited in claim 16 is not anticipated by either JP 9-245356 or JP 10-269588.

New claims 17-20:

New claims 17-20 have been added to recite additional features of the present invention that are believed to be patentable over the cited art of record.

New claim 17 recites that the step-shaped dielectric film includes a plurality of four-step units, in which each of the plurality of four-step units including a first step having a first length, a second step having a second length shorter than the first length, a third step having the first length, and a fourth step having the second length. Such a structure is not disclosed or suggested by the cited art of record.

New claim 18 recites that the second optical separating means includes a holographic optical element that is divided into four regions by two divided lines respectively in parallel with a radial direction and a tangential direction of the optical recording medium, and wherein pitches of the lattices of a first two of the four regions are different from pitches of the lattices of the other two of the four regions. Such a structure of the second optical separating means is not disclosed or suggested by the cited art of record.

New claims 19 and 20 recite the structure of the second light separating means (or unit), which is used to obtain a first group of optical light having a different optical strength than a second group of optical light. The structure that allows this is a step-shaped structure that has different-length steps, as clearly shown in Figure 10 of the drawings.

Figures 6A and 6B of Katayama show a step structure whereby each step is of the same length as the other steps. As described on page 6 of the specification, this results in a diffraction efficiency of the +1st order diffracted light and the diffraction efficiency of the -1st order diffracted light being equal to each other. The present invention according to claims 19 and 20 provides for a large variation in the diffraction efficiencies of the two different groups of light, and thereby improves the optical detection system as compared to the prior art.

Neither Taniguchi et al. nor Ju et al. nor the acknowledged prior art discloses or suggests the use of different-length steps in order to obtain different groups of light having a different optical signal strength as compared to each other. Accordingly, claims 19 and 20 are patentable for this additional reason.

Applicant believes that the present application is now in condition for allowance, and an early indication of allowance is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741.

If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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Date

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